

DESCRIPTION OF THE PREDACEOUS LARVA OF
PSEUDOGAURAX SIGNATUS (LOEW) (DIPTERA: CHLOROPIDAE)

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Abstract.—A description of the predaceous larva of *Pseudogaurax signatus* (Loew) (Diptera: Chloropidae) includes an illustration of the cephalopharyngeal skeleton, spinule pattern and posterior spiracles and scanning electron micrographs of the cuticular armature, facial mask and the anterior and posterior spiracles.

Key Words: larval morphology, ultrastructure, spider-parasite

Pseudogaurax Malloch is a large, mostly tropical group (Sabrosky 1966) whose larvae are predators of the immature stages of several species of Araneae and Insecta. *Pseudogaurax signatus* (Loew) was originally placed in the genus *Gaurax* Loew. Sabrosky (1945, 1966) has provided the only taxonomic treatment on this group since Hall (1937) transferred the species to the genus *Pseudogaurax*. *P. signatus* has been reared from egg sacs of the spiders *Latrodectus mactans* (Fabr.), *Argiope riparia* (Lucas) and *Araneus* sp., oothecae of Mantidae (Davidson 1896, Hall 1937, Breland 1941), and the pupae of *Hyalophora cecropia* (L.) (Saturniidae) and *Euproctis chrysorrhoea* (L.) (Lymantriidae), (Sabrosky 1945).

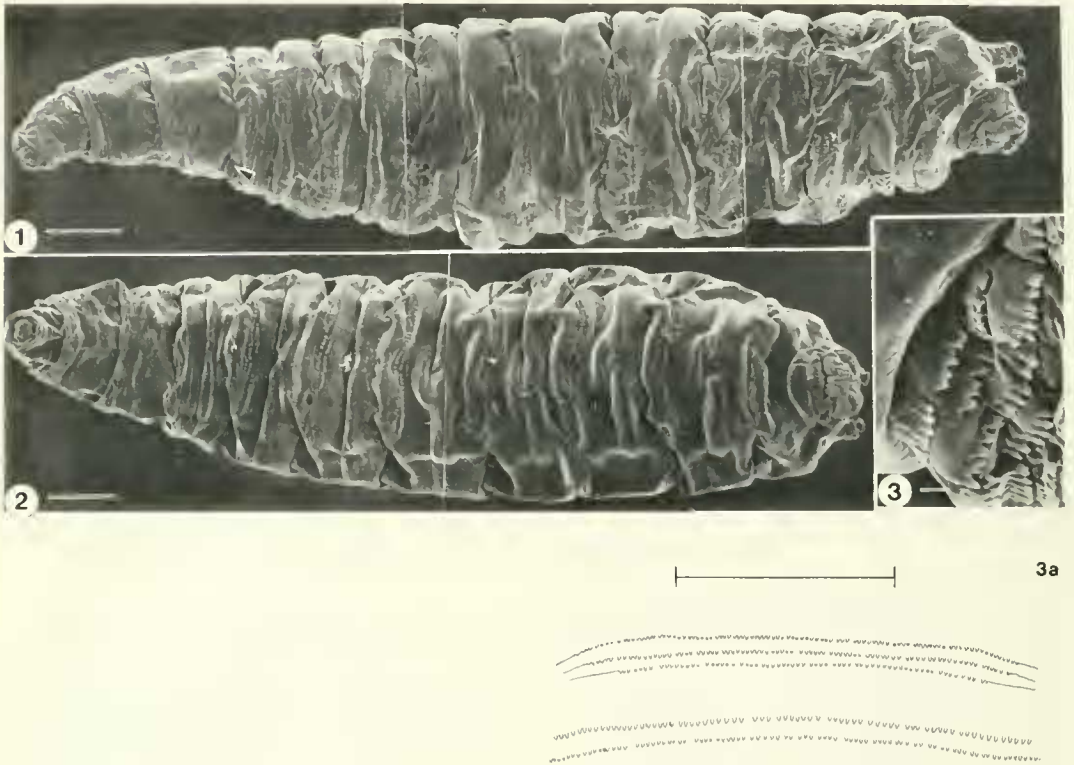
Chloropid larvae display diverse feeding habits, including phytophagy, scatophagy, necrophagy, and predation. The larval stages of most chloropid species are unknown, and most available descriptions are for phytophagous species. The only known larval descriptions of predaceous chloropids are for *Steleocerellus latiseta* (Lamb) (Kirk-Spriggs 1986) and *Pseudogaurax anchora* (Loew) (Howard 1916); in the latter however, only the anterior spiracles and pupar-

ium were described. Roberts (1971) and Teskey (1981b) have emphasized that detailed larval descriptions of all immature stages together with descriptions of adults will undoubtedly be useful in elucidating phylogenetic relationships and the evolution of trophic diversity in this group of flies. We thus describe the third-instar larva of *Pseudogaurax signatus* (Loew).

MATERIALS AND METHODS

One *Argiope* sp. egg sac was collected in the field and taken to the laboratory for dissection. A portion of the total number of third-instar larvae of *P. signatus* found within the egg sac were extracted, killed in KAAD, and preserved in 70% ethanol. The incision made in the egg sac was closed and the egg sac placed in a rearing chamber at room temperature until adult flies emerged.

For SEM examination, the larvae were dehydrated in ethanol and degreased in pentane. The specimens were then rehydrated, washed in 0.1 M phosphate buffer (pH 7.3), and postfixed in 2% osmium tetroxide in the same buffer. After dehydration in ethanol, specimens were critical point dried,



Figs. 1-3a. *Pseudogaurax signatus*, larva. 1, Lateral view. Line scale = 0.25 mm. 2, Ventral view. Line scale = 0.25 mm. 3, Spinules on anteroventral portion of 1st abdominal segment (enlargement of area indicated by arrow in Fig. 1). Line scale = 10 μ m. 3a, Spinule pattern on 4th abdominal segment (ventral view). Line scale = 0.05 mm.

mounted on stubs with silver paint and coated with gold-palladium in a Polaron e5100 sputter coater. The ultrastructure of the larva was studied with an Hitachi HH-

S-2R scanning electron microscope at an accelerating voltage of 20 kV.

For study of the cephalopharyngeal skeleton, larvae were cleared in 20% hot potas-

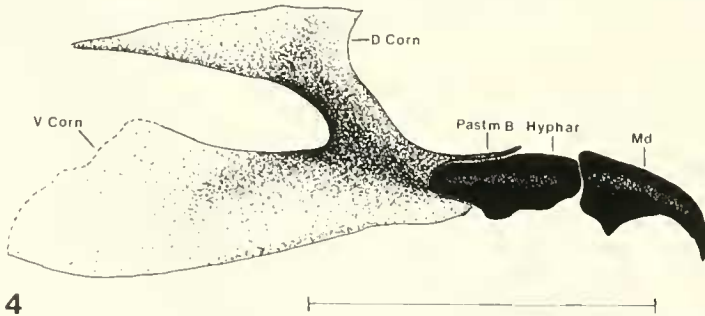
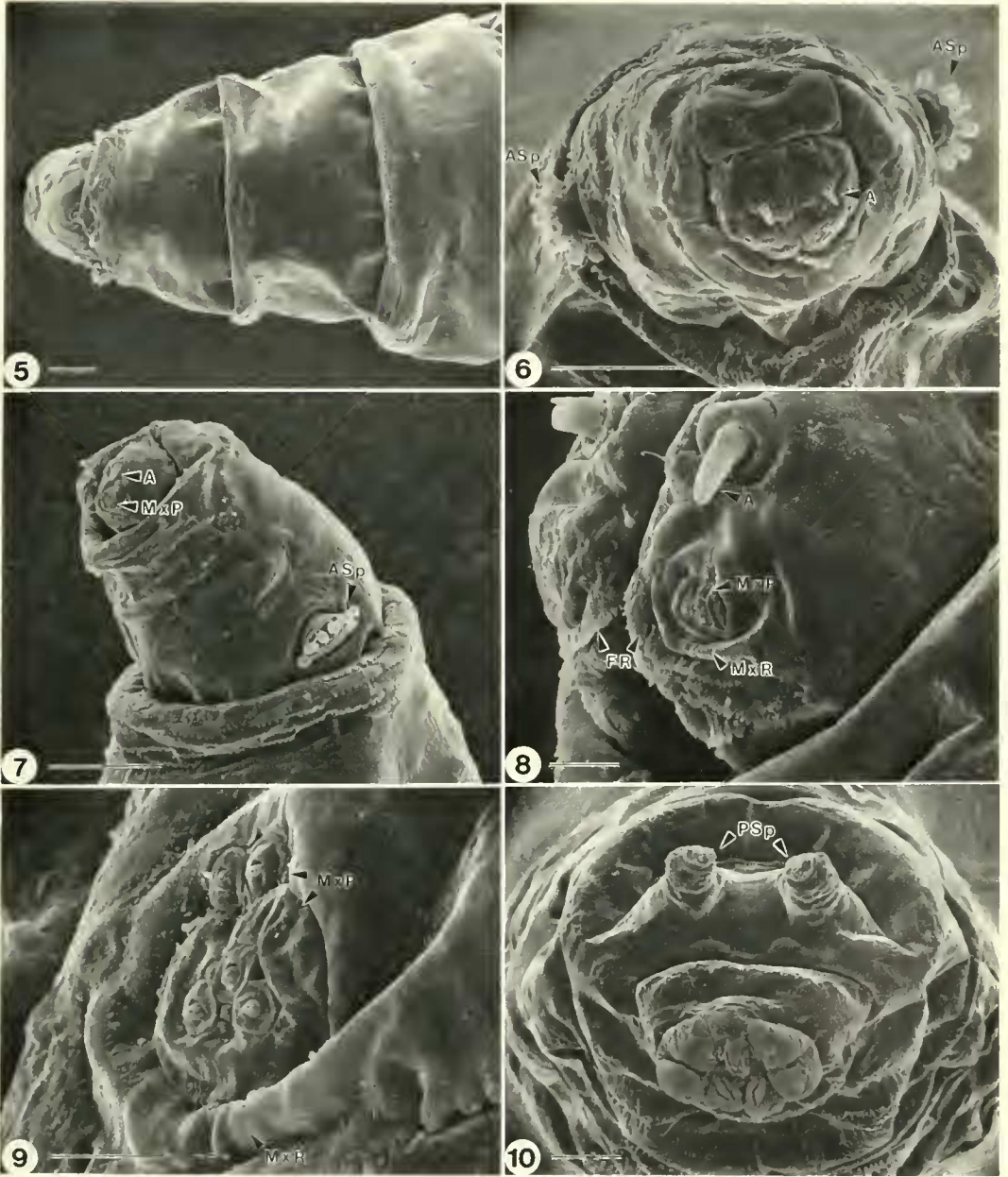
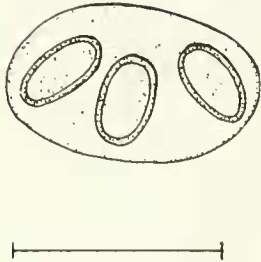


Fig. 4. *Pseudogaurax signatus*, larva, cephalopharyngeal skeleton (lateral view). D Corn = Dorsal Cornu, Hyphar = Hypopharyngeal Sclerite, Md = Mandible, Pastm B = Parastomal Bar, V Corn = Ventral Cornu. Line scale = 0.12 mm.



Figs. 5–11. *Pseudogaurax signatus*, larva. 5, Thorax, and 1st abdominal segment (dorsal view). 6, Head, facial mask (anterolateral view). 7, Head and prothorax (lateral view). 8, Head (ventrolateral view). 9, Maxillary palpus (ventrolateral view). 10, Anal plate (posterior view). Line scale for Figs. 5–7 = 100 μ m. Line scale for Figs. 8–10 = 10 μ m. A = Antenna, ASp = Anterior Spiracle, FR = Frontal Rami, MxP = Maxillary Palpus, MxR = Maxillary Ring, PSp = Posterior Spiracle. 11, Posterior spiracle (posterior view). Line scale = 0.05 mm.

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sium hydroxide, mounted on microscope slides in glycerine, and examined with an Olympus compound microscope.

DESCRIPTION

Larva vermiform, tapering anterior of third abdominal segment, length 4.0–5.0 mm, greatest width 0.96 mm, creamy white; anterior margin of thoracic and first abdominal segments with several irregular rows of spinules on creeping welts (Figs. 1–3, 5). Spinules arranged in 5 regular but broken rows on ventral surface of abdominal segments 2–10; spinules coarse, oriented posteriorly, variable in size with those on 4th row larger (Fig. 3a); all abdominal segments with two annulations, thoracic segments without annulations.

Facial mask on cephalic segment bilobed, hooded by first thoracic segment (Figs. 6–7); frontal rami consisting of two oral ridges, serrate and overlapping (Fig. 8); antenna prominent, one-segmented, directed anteroventrally (Figs. 6–8); maxillary ring incomplete, forming a semicircle, opening dorsally; maxillary palpus in two sensillar groups (Figs. 8–9); a ventral triad is delimited by fleshy folds above the maxillary ring, abutting a dorsally located pair.

Mandibles of cephalopharyngeal skeleton separate, strongly sclerotized, basal portion deepest, narrowing distally, curved apically (Fig. 4); hypopharyngeal sclerite nearly same length as mandibles, similar in degree of

melanization and sclerotization; parastomal sclerites slender, appearing as narrow bands above hypopharyngeal sclerite in lateral view, fused basally with tentoropharyngeal sclerite, but much less sclerotized; labial sclerite present, small, located between anterior ends of hypopharyngeal sclerites, not visible in lateral view; ventral cornu of tentoropharyngeal sclerite broader and longer than dorsal cornu, both processes heavily sclerotized along inner margins. Anterior spiracles palmate, with seven short papillae (Figs. 6–7); posterior spiracles 0.06 mm wide, convergent with protuberant bases 0.18 mm apart, three spiracular openings, oval, longitudinal axis of middle opening directed dorsally, lateral openings angled, longitudinal axes converging towards middle opening dorsally (Fig. 11); anal plate oval and fleshy (Fig. 10).

Specimens examined.—Larvae (n = 28): Label data Miss(issippi), Oktibbeha Co., Dorman Lake; 21 Jan(uary) 1986; Coll. Adam Asquith. Collected from *Argiope* sp. egg sac. Adults: (6 males, 7 females): Label data same as above except for second label: Reared from *Argiope* sp. egg sac. All voucher specimens are deposited in the Mississippi Entomological Museum at Mississippi State University.

DISCUSSION

The larva of *Pseudogauwax signatus* is comparable to that of *P. anchora*. Both lack the frond-like scales found on the posterior spiracles of other chloropid species such as *Meromyza laeta* Meigen (Fedoseyeva 1966), *Polyodaspis ruficornis* Macquart (Kiauka 1974), and *Ectocephala capillata* (Coquillet), (Deeming 1977, 1985). The antennae of *P. signatus* appear to be longer and more prominent than those of *P. anchora*, but being a contractile organ (Yamada et al. 1981) the variation in length may be a result of differential extension during fixation. We note that the terms antenna and maxillary palpi are adopted here because of their use in the taxonomic literature (Teskey 1981a),

but these structures also represent the dorsal and terminal organs respectively of Bolwig (1946), that are commonly used in descriptive morphology (Chu-Wang and Axtell 1971, 1972, Yamada et al. 1981).

The spinules found on the body of *P. signatus* are typical for many described chloropid larvae. However, in *Meromyza* they are absent (Fedoseyeva 1966) and in *Polyodaspis ruficornis* Macquart the spinules are restricted to the ventral surface of the abdomen (Kiauka 1974). The mandibles of *P. signatus* are similar to those of the necrophagous chloropid *Conioscinella hinkleyi* (Malloch) (Norrbon 1983), and a predaceous species *Steleocerellus latisetula* (Lamb) (Kirk-Spriggs 1986), in being slightly more elongate and pointed than those of phytophagous larvae. Unfortunately, no other characters seem to indicate the predatory habits of this larva.

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